The effect of cation distribution on magnetization of ZnFe$_2$O$_4$ nanoparticles

M. Mozaffari a,b, M. Eghbali Arani a, J. Amighian a, J.

Department of Physics, Faculty of Science, University of Isfahan, Isfahan, 81746-73441, Iran a Physics Department, Razi University, Tagheboroostan, Kermanshah, Iran

Articlenfo Article history: Received 18 December 2009 Available online 10 June 2010 Keywords: Zinc ferrite Sol–gel process Nanoparticle Magnetic property

Abstract In this work zinc ferrite (ZnFe$_2$O$_4$) nanoparticles have been prepared by sol–gel method in two different media, one acidic and another one basic and then annealed at different temperatures from 350 to 800°C.

XRD investigations show that both samples have a single-phase spinel structure. Mean crystallite sizes of the samples were calculated using Scherrer's formula, which are 13 and 16 nm for the samples prepared in acidic and basic media, respectively. The variation of cation distribution in the samples was estimated by the ratio of (220) and (222) intensity diffraction peaks and the results show that as-prepared nanoparticles have different ionic distributions in comparison with that of bulk zinc ferrite. Also, the results show that by increasing annealing temperature the ionic distribution of zinc ferritenanoparticles is stabilized to that of bulk sample. The magnetic properties of the samples were studied by VSM and the results show that zinc ferritenanoparticles have a ferrimagnetic behavior. Also, the morphology of the powders was examined by TEM.